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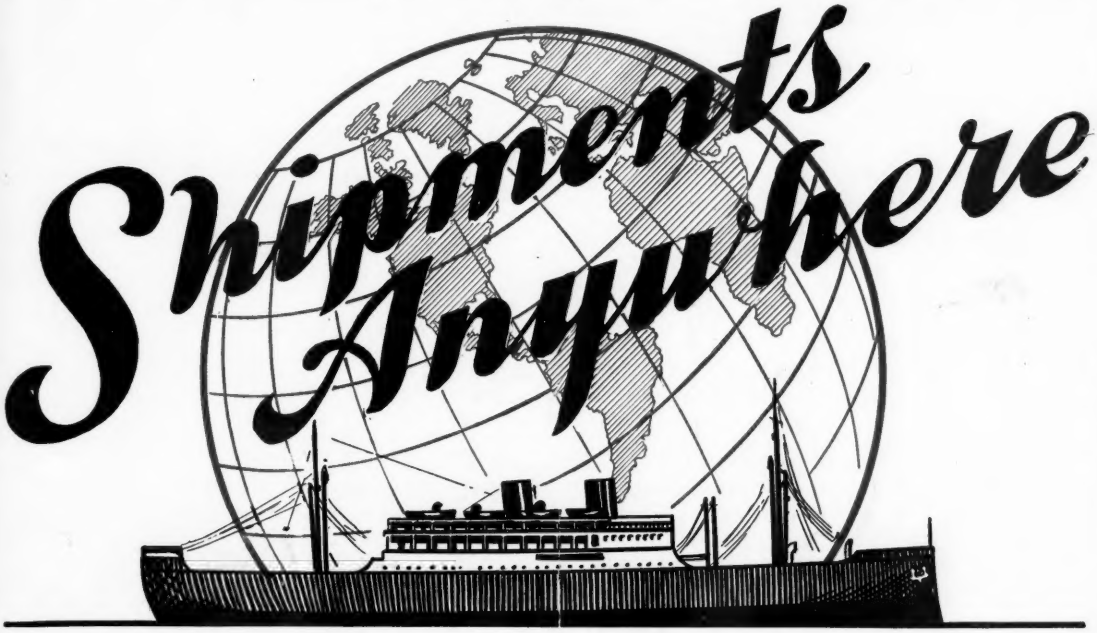

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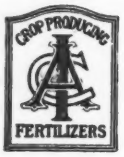
TRADE  MARK

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See Page 21

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Vol. 92 JANUARY 6, 1940 No. 1

Plant Food Developments

By H. H. ZIMMERLEY

Director, Virginia Truck Experiment Station, Norfolk, Virginia

An Address before the Fifteenth Annual Southern Convention of The National Fertilizer Association, Atlanta, Georgia, November 8, 1939.

IT is possible that agricultural historians in the future may refer to the period through which we have been passing during the past decade or two as a great transitional period in American agriculture. The marked changes in agriculture brought about by the widespread motorization of cultural and transportational equipment and by world-wide economic developments have stimulated experimentation in the fields of economics and biology. There is no doubt that the recent economic condition of agriculture has greatly stimulated research by Federal and State institutions along those lines which tend to lower unit production costs or to improve the quality of farm products. Progress has been greatly accelerated by marked improvements in research equipment, by increases in Federal and State appropriations, and by what is far the more important, the services of a host of young men well trained in our graduate institutions to solve the vitally fundamental problems in biological research. So rapid strides have been made in the field of plant nutrition that farmers, research workers, and those engaged in the manufacture and sale of fertilizers are puzzled when they try to grasp the full significance of these new developments and apply them in agricultural practice. It is the purpose of this paper to discuss briefly some of the more important phases of recent developments in plant-food research and suggest the possibilities of their practical application.

Fertilizer Placement

Let us start with some major accomplishment that will serve as a background for our discussion. From the standpoint of definite achievement over a wide territory and with a great variety of crops, the subject of fertilizer placement heads the list. The work of the Joint Committee on Fertilizer Application and its cooperators should serve as a classical example of what may be accomplished by a large group of workers with carefully coordinated efforts. At the very beginning the problem was fairly well defined. Growers, fertilizer manufacturers, and research workers realized that much valuable plant food was being haphazardly applied, resulting in a tremendous waste of fertilizer, seed and human energy, which would ultimately be a decisive factor in impoverishing the entire agricultural industry. A research program, started in a modest way in 1929 with 4 experiments with two crops in 3 states, soon expanded along a wide front and is now a major line of investigation and nation-wide in scope. By 1938 the volume of experimental work had expanded to include 146 experiments at 70 locations, in 27 states, with 29 different crops. It is expected that the report for 1939 will show further increases.

It was realized at the beginning that an extensive project of this kind could not be carried on unless each group performed its assigned task wholeheartedly. The work of designing and manufacturing experimental equipment, without which the work could not even have started, was admirably carried on by the combined efforts of the workers in the Bureau of Agricultural Engineering of the U. S. Department of Agriculture and a group of farm equipment manufacturers. The National Fertilizer Association performed the important task of keeping the machinery well oiled and

running efficiently and in assembling, publishing, and distributing the reports. Members of the American Society of Agricultural Engineers, American Society of Agronomy, American Society of Horticultural Science, Farm Equipment Institute and National Fertilizer Association served on various subcommittees in charge of special phases of work. And last but not least comes the host of cooperators in the various experiment stations, the workers on the front line trenches, who carried on the work in the field experiments in their respective states.

One outstanding accomplishment is the fact that an analysis of the great mass of data accumulated over a ten-year period points to some very definite conclusions applicable to a great variety of crops grown on markedly different soil types under a wide variation of climatic conditions. These may be briefly summarized as follows:

Fertilizers when applied simultaneously with the planting of the seed should be placed in narrow bands either on one side or both sides of the seed row and, in most instances, slightly below the level of the seed, to prevent fertilizer injury to seeds and seedling plants. The optimum distance of location of the bands both laterally and horizontally with respect to the seed in the row has been determined for most of the major crops on many of the more important soil types.

Band placement has given consistently higher yields than have other types of placement during dry periods when the application of fertilizer in contact with the seed, too near the seed, or directly under the seed has resulted in marked injury to either the seed or to the seedling plants. Even during periods of favorable soil moisture conditions it has proved equal and in most cases superior to other types of placement.

Side-placement in narrow bands permits the safe use of large amounts of fertilizer at the time of planting, and gives maximum response from small quantities by providing a relatively high concentration of nutrients near, but not too close to, the roots of the young plants. It results in a marked increase in efficiency of the phosphorus by placing it where it is available to the plant through its entire period of growth and by retarding the rate of phosphorus fixation. This frequently results in earlier maturity and a product of superior quality.

It permits the use of a better nutrient balance in the fertilizer. Certain crops as snap beans and lima beans, especially sensitive to fertilizer toxicity, have failed to show response to potash even on soils showing a very low available content unless fertilizer containing potash was applied in bands at a safe distance from the seed. This phase opens up an entirely new field of research. It shows that the results of many of our former fertilizer experiments, where we now know that fertilizer was improperly applied, should be repeated, using the band method of application, to tell us the whole story regarding response to different N P K ratios.

The results of placement studies with transplanted crops indicate chiefly that side-placement in bands is good insurance against a poor stand of plants, especially under unfavorable weather conditions. However, in the case of tobacco and sweet potatoes, band placement has generally resulted in marked increase in yield even where the effect on stand was not a factor.

Summary of Placement Experiments

After a period of ten years a great mass of data has been collected, the interpretation of which would greatly cloud the picture were it not for the summaries of achievements and recommendations prepared at intervals by the chairmen of the groups responsible for the various crops. The latest summary was published by The National Fertilizer Association in April, 1938, under the title "Methods of Applying Fertilizer." The following are a few of the summations made regarding the economic value of band placement for some of the major crops in the south.

Average yields of cotton in experiments in the southeastern states, in which fertilizer was placed in bands on each side of the row, were 104 pounds an acre more than where fertilizers were mixed with the soil under the seed in a zone about 3½ inches wide. With favorable soil mixture conditions, results of various placements did not differ widely, but side-placement generally gave better results under all conditions. This procedure is worthy of adoption for the sake of insuring a good stand which should result in larger yields.

With the tobacco crop, the average results for a period of 2 to 4 years in a total of 12 experiments indicate an actual average value of $306 per acre where fertilizer was applied in bands 2½ inches to the side and 1 inch below the root crown as compared with $284 an acre where application was made by the local method, which was drilling in the row by hand and mixing with the soil before ridging. This increase of $22 per acre more than paid the fertilizer bill.

Results with potatoes in six states over a four- or five-year period showed that side-placement resulted in higher yield in 23 of the 27 tests. In Virginia, the only southern state included, side-placement 2 inches to each side and at the seed piece level gave an average increase of 20 bushels per acre over a period of four years. Placement demonstrations in North Carolina at 6 locations in four different counties in 1937 showed an average increase of 15.2 barrels per acre for the side band placement when compared with the local methods of applying the fertilizer in the row.

Proper placement is exceedingly important with sweet potatoes. Since application in the row prior to setting the plants has been found exceedingly hazardous, most successful growers delay application until a week or two after plants have been set. In Virginia in 1938 the application of 1,000 lb. of fertilizer in bands 4.5 inches to each side and 3 inches below the surface by machine at transplanting produced an average yield of 43 bu. more per acre than did similar amounts applied in delayed applications made according to a previously recommended practice.

Experiments in the south have shown that peas and beans are very sensitive to injury by the large amounts of fertilizer used in that area. Direct contact in most cases ruined the stand in dry seasons and resulted either in low yields or in total losses. Side-placement in bands proved safe in all cases and often increased yields as much as 40 bushels per acre over those obtained by the methods of application generally used by the more successful growers.

Cooperation Needed

The adoption of the machine placement in bands has been rather slow in many parts of the south because growers are hesitant in purchasing new distributing machines until the old ones wear out. Then, too, many growers are not fully aware of the benefit of better placement or think they cannot afford to buy new machinery. You of the fertilizer industry can perform a much needed service both to yourself and the grower by making a more thorough study of the experimental results obtained in the states in which you operate, in order that you may be able to inform the grower regarding the type of equipment that will be best suited to his particular need. A concerted effort on your part should result in a better utilization of your product and better profits to growers, which will in turn react to your advantage.

Fertilizer Composition

It has been far easier to sketch the fairly distinct outline of the picture represented by fertilizer application than it will be to paint even a hazy one dealing with fertilizer composition. There is still a divided school of thought in regard to the question of sources of nitrogen, particularly with respect to the relative value of the so-called "natural" organics as compared with other forms. Undoubtedly, in many instances the deleterious effects obtained in the earlier fertilizer experiments by the continuous use of certain mineral fertilizers over a long period were due largely to the acidifying effects, ultimately resulting in magnesium deficiency and aluminum toxicity. Difficulties arising from this source are now rapidly being eliminated by the widespread use of neutral fertilizers. Mehring estimates that the quantity of liming materials used in making mixed fertilizer increased from 98,654 tons in 1933 to 302,751 tons in 1936 and the net equivalent acidity of an average ton of mixed fertilizer dropped from 152 lb. to 19 lb. during that period. This rapid increase in popularity of neutral fertilizers is encouraging since it is an important step toward the prevention of further acidification of our soils and has already largely eliminated injury from magnesium deficiency in crops along the Middle Atlantic Coast. The only instance, to my knowledge, where acid-forming mixtures are preferable is where potato soils are not sufficiently acid to keep scab under control.

It is now generally conceded by agronomists that the water-insoluble organic forms of nitrogen are not superior to the water-soluble forms for cotton, corn and other grain crops, or for truck crops where the total amount of nitrogen applied in the mixed fertilizer does not exceed 30 to 40 lb. per acre. However, the agronomists composing the Tobacco Fertilizer Committee for the States of Virginia, North Carolina, South Carolina, and Georgia still recommend that one-third of the nitrogen be derived from organic sources for maintenance of high quality in tobacco.

The chief point of disagreement lies in the recommendations with respect to sources of nitrogen in potato and truck fertilizers where as much as 120 lb. of nitrogen are commonly applied per acre in a mixed fertilizer. Growers in eastern Virginia, and possibly in other potato growing regions of the south, would be hesitant in accepting recommendations for eliminating all water-soluble nitrogen from potato fertilizers unless they could be furnished convincing experimental evidence obtained on

a wide variety of soils over a period of three or more years. Results obtained in North Carolina and South Carolina indicate that the importance of water-insoluble nitrogen in potato fertilizer has been over-emphasized. A comprehensive study along this line will be started in the near future in Virginia.

Forms of Potash

In this connection it may be well to mention the potash situation particularly with respect to relative value of muriate and sulphate of potash. According to information received from a very reliable source, there is no basis for belief that there will be a shortage of potash for use in agriculture and the chemical industries during the next year. American companies, by running to capacity, can produce more potash annually, without increase in refinery capacity, than was used in this country last year. Should there be a slight shortage of sulphate of potash next year, it can be handled by substituting muriate for sulphate where the latter is not practically needed, so that there will be sufficient sulphate for tobacco and possibly a few other crops. A considerable amount of sulphate form is still being used in Florida in celery and other truck crops, although experimental evidence obtained in that state show muriate to be equal to, and in some instances superior to, the sulphate form for these crops. The results of experiments conducted in the south indicate that muriate of potash is fully as satisfactory as the sulphate form for cabbage, corn, cotton, cowpeas, oats, potatoes, sweet potatoes and wheat. Florida reports indicate need of the sulphate form for pineapples and possibly for certain varieties of citrus fruits. Georgia results with pimiento peppers indicate that the sulphate form produces a thicker fruit wall. The sulphate form is preferable to the muriate for tobacco, but a chlorine content not in excess of 2 per cent is considered beneficial.

It has been suggested that the fertilizer trade request growers to permit substitutions of muriate for sulphate wherever experimental evidence has shown this to be a safe procedure, in order to prevent any possible shortage of the sulphate form for crops which really need it.

Soil Tests

We will now pass on to a discussion of type of research where the methods of approach are still in a controversial state. Interest in rapid tests for estimating the productivity level of the soil with respect to available mineral nutrients, organic content, and soil reaction has swept across the country from the middle west to the northeastern states and down along the Atlantic seaboard into all parts of the south. There are those who view with a degree of apprehension the so rapid spread of a new practice, part of which is still in its embryonic state as far as proven adaptability to southern soils and crops.

However, even the severest critics must concede that the value of certain phases of this system have already been established over a wide area. The value of a rapid and accurate method for the determination of soil reaction, made possible through the perfection of the quinhydrone and the glass electrodes, is no longer questioned. It has been, and probably always will be, one of the more valuable rapid soil tests. Factors associated with excessive soil acidity probably have been responsible for more crop failures than the use of poorly balanced fertilizers. Since the optimum soil reactions have already been determined for most crops, it is now a simple matter for a grower to have his soil tested and determine the amount of lime needed. The rapid tests for calcium, magnesium, and toxic aluminum have proved valuable and should be made in addition to a test for pH. The presence of even small amounts of toxic aluminum indicates an immediate need of lime for satisfactory growth of aluminum sensitive plants. Soils may be within the optimum growth reaction range and still require an addition of lime to supply a deficiency of calcium or magnesium.

During the past few years methods have been devised for a fairly rapid determination of the organic matter content of the soils. Readings obtained by this test are especially convenient for evaluating the relative fertility level of the soil in question in comparison with that of the more productive soils of a similar type. It also indicates fairly well the potential supply of nitrogen in the soil and the need for increasing the nitrogen and the organic content by turning under green manural crops. Proper treatments of all southern soils on the basis of the needs shown only by the organic matter and the soil reaction tests alone would virtually revolutionize southern agriculture.

The chief source of controversy has arisen regarding the advisability of making recommendations for applications of phosphorus and potash on the basis of rapid soil tests until these tests have been more fully calibrated under field conditions in the south. Plant response to applications of phosphorus and

(Continued on page 22)

The South's Changing Agriculture

By PAUL W. CHAPMAN

Dean, College of Agriculture, The University of Georgia

An Address delivered before The National Fertilizer Association Convention, Atlanta, November 8, 1939.

EVERY successful business faces the necessity of making adjustments that will keep it atuned to existing conditions. These adjustments may be no more fundamental than the typical yearly models of the automobile manufacturers; or they may be as drastic as that of the wagon maker of a generation ago whose plant today is devoted to producing trucks and busses. Today is not yesterday. Much that was customary and familiar, things that we took most surely for granted, we find crumbling before our staring eyes. Progress—even existence—means change.

Adjustment is as essential to agriculture as to industrial and commercial occupations. Each year there is published what we call outlook material. This is a guide to those minor adjustments in farming which may be compared to the annual models produced by automobile manufacturers. But periodically in the history of commercial agriculture there come times when the type of farming must be changed. We of the South are living in such a period today.

Why Do We Have a Cotton Economy?

Already in the agricultural history of the South we have made changes in farming as drastic as that of the wagon maker who became a manufacturer of trucks and busses. In Georgia, for example, at one time rice was our most important cash crop. Later, indigo was our most valuable agricultural contribution to commerce and industry. Now that we have lived under a cotton economy for almost 150 years, it is interesting—if not essential to an understanding of our present situation—to ask: Why was the economy which has determined the destiny of our people established in the first place?

The economic laws which control the destiny of the 10 million persons living on cotton farms in America were not written in the legislative halls of our own country, but in the workshops of England. It was the invention and use of cotton textile machinery which established in England the factory system of manufacturing that is now universal throughout the world. And it was the inauguration of the factory system which led to the demand for raw cotton as a source of cheap fabrics.

To supply England's demand for raw cotton the people in the southern portion of the United States abandoned one economy of living and established another. The South's dominant position of leadership in American industry, developed as it was through many small units, had no appeal compared with the romantic possibilities of farming on a vast and magnificent scale. Factories and shops were closed. And the people of the South—just as those in every other colony in the British Empire—devoted themselves to the task of producing raw materials to keep the wheels of England's industries moving.

It is an interesting fact, looking back upon the history of 150 years, to realize that we in the southern part of the United States established hand-labor to support and make possible the first large-scale machine-labor economy in the world. And it is interesting and significant to realize that our forefathers in the South established a hand-labor economy in the New World just at the very time when such an economy was abandoned by the British Empire for its citizens living in England.

We today do not censure our forefathers who one hundred and fifty years ago abandoned the safe and sane economy which we are attempting to re-establish. By recalling facts which led to the development of the "cotton economy" under which we have lived, we hope to hasten readjustment by pointing out the fact that the circumstances which brought such an economy into existence no longer prevail. We merely wish to act as intelligently as our ancestors who were quick to see and meet a market demand.

The effects of the loss of foreign outlets for American cotton are known to every person

who lives in the South, even though definite details may be lacking. There are those who censure the Federal Government for following short-sighted and unwise policies. But, be that as it may, the fact remains that a market once lost is never fully regained and, as a result, it becomes necessary for us to accept conditions as they exist and go forward with the necessary changes in our farming progress.

It should be said, however, that cotton is grown commercially in more than 60 countries of the world, that in recent years there has been an expansion in acreage and production in most of these countries and that improvements in all phases of the cotton industry are being made in all parts of the world.

It is very interesting to me personally to contemplate the part that the British Empire has played in all these changes. For a number of years the mills of England were our best customers, but all the time steps were being taken, as might have been expected, to free the Empire from the necessity of buying American cotton. In India, for example, the British have placed some 40 millions of acres under irrigation. In Uganda in Africa, a protectorate of the British Empire, a tax is collected from the native cotton growers for the purpose of further expanding the industry. These examples are typical of dozens which might be cited to show the objectives of the British Empire with respect to this phase of her trade relations with the United States. Verily, the British gave us an economy; and the British are taking it away.

It should also be pointed out that, unwise as the policies of the Federal Government may have been with respect to cotton, all exports of the United States are declining, and that agricultural exports have declined more rapidly than those of other types. Except in periods of emergency, this is what might be expected; it is a trend that, outside of war periods, will continue.

Land and People Without a Job

It must be remembered that foreign trade is just what the term implies—an exchange of goods. We, as a nation, are so nearly self-sustaining that there are few things we want from other lands. And since we have so much of the world's gold, it is practically impossible to keep our exports on the level of our position as a debtor nation, which we held prior to the World War.

As a result of the decline in markets for cotton we have both land and people in the South that have lost their former jobs. This year we withheld 10 million acres from cotton production—all land looking for a new job, which, incidentally is not difficult to discover.

But more significant, we have in the Southern States 2½ million farm people on cotton-type farms that are just as much without a job —in terms of our former system of farming— as if they have been working for a factory that had ceased to exist. These are the persons who formerly supplied the cotton for markets that no longer exist.

Perhaps, unfortunately, the agricultural situation does not operate like an industrial one. When an industry closes it is possible to say: "Here are the individuals who are directly affected." But in agriculture those who lost their markets cannot be identified and therefore keep on working and depress the income of all engaged in the production of the same commodities. Thus, in reality and truth, every farmer becomes his brother's keeper; he is vitally concerned with anything that in any way changes a market situation.

Characteristics of the Cotton Economy

Our problem in the South today is that of finding a job for 10 to 20 million acres of land and approximately 2½ million persons. It should not be difficult to find a way to use the land; finding work for the people, however, presents a difficult problem.

The farm economy under which we have lived for 150 years is chiefly characterized by a lack of land and a surplus of farm labor. This situation is the crux of the farm situation in the South today.

That the statement is correct is evidenced by the fact that we have 8.4 acres of cropland in the ten major cotton producing states, as compared with 13.1 for the United States as a whole, and 18.3 for the states in the Corn Belt.

Oklahoma and Texas have the largest per capita farm income in the South, for the principal reason that in these states there is a larger acreage of cropland per person than in the other important cotton-growing states. Of course, we cannot immediately increase the cropland available for all persons engaged in farming in the Southern States. But we have a vast acreage at present that is not productive and, as the system of farming changes, much of this land may be so used as to produce

an income—land that was not essential to the hand-labor economy that was cotton farming.

As the system of farming changes, it is inevitable, too, that many engaged in commercial farming in the past will find some non-farm employment. Already this trend has been going forward to a greater degree than has been realized. Recently, for example, I had occasion to analyze the farming operations of one of the best counties of north Georgia. It was found that the farm income of that county today is about the same as the income for 1920, but the people now engaged in farming in this county are better off than they were twenty years ago for there are 4,000 fewer persons among whom the income must be divided.

Finding a Job for the Land

As has previously been stated, it is not difficult to find a job for the land that has been withdrawn from cotton production. The first and immediate need of Southern agriculture is production of sufficient food and feed crops to make this part of the country self-sustaining so far as the farm people are concerned. We might not limit this goal to the persons living on farms, but it can be so restricted at the present time and still involve an enormous possibility for the utilization of additional acres.

This is evidenced by the fact that in the ten major cotton-producing states of the nation in 1935, there were 600,000 farms without a milk cow; 800,000 without a hog; 300,000 without a chicken; 600,000 without a garden; 1,800,000 without an orchard; and 1,600 without a plowable pasture.

So rapid has been the change in the farming system of the South in recent years that these figures, taken from the last census, no longer give a true picture of the present situation but we realize, of course, that, as great as the progress of recent years has been, there are still hundreds of thousands of farms in the South that do not produce the main essentials for an adequate diet for the farm family.

How many acres would be required for the production of an adequate supply of food and feed crops cannot be accurately determined. We do know that many of the farms of the South today are not large enough to sustain the number of people now living on these farms. This means that millions of acres could easily be utilized in the production of additional food and feed crops which constitute the first necessity of any people.

To find a job for the two and one-half million people who are no longer needed to produce the quantity of cotton which can be sold, is a far more difficult task than finding a way to utilize the land. Practically every farm enterprise to which we may turn require less labor per acre than cotton.

Finding a Job for the People

It is characteristic of our economy that we have too many people in relation to the acreage. We have not, therefore, taken advantage of the machinery and power which have been important factors in increasing the income of farm people in other sections, as well as all of the people who are engaged in non-farm occupation. It is inevitable that before a new system of farm economy is established in the South a number of these people must find jobs in non-farm occupations or be reduced to a subsistence level of existence. This social problem is the most difficult one with which we have to contend. Changes cannot be made so rapidly as to deprive a large number of these people of the privilege of working.

This problem must be considered in the farm enterprises that are selected for emphasis. There is a wide variation in the labor requirements for the production of various agricultural commodities and the South will find its greatest economic advantage in the production of those things which require the greatest amount of human labor in their production. This means that, other things being equal, we are better prepared to produce vegetables than we are field crops which may be grown widely throughout the nation. It means, too, that the greatest industrial possibility for the southern states lies within the field of processing agricultural products. Other examples of the same kind might be given. We must place emphasis upon those things which can provide employment for the largest number of workers.

(To be continued in the next issue)

DR. B. W. KILGORE HONORED

The Distinguished Service Award, given annually by the American Farm Bureau Federation to two persons who have contributed outstanding service to American agriculture, was conferred this year upon Dr. B. W. Kilgore, North Carolina State Chemist. The second recipient was Chester C. Davis of the Federal Reserve Board. The Progressive Farmer points out that only three other Southerners have ever received this honor—President N. L. Duncan of Auburn, Dr. Tate Butler, and Dr. H. A. Morgan.

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State Cotton Acreage Allotments Announced

State cotton acreage allotments for 1940, totalling 27,070,173 acres, were announced on January 3rd by the Agricultural Adjustment Administration. The national allotment for 1940 is 472,842 acres less than for 1939, but the total acreage allotted to farmers under the minimum allotment provisions of the Agricultural Adjustment Act will be larger than last year, which will offset a substantial part of the reduction.

The 27,070,173 acres allotted directly to 19 cotton-producing states, plus the increase under the minimum allotment provisions, will result, with normal yields, in a crop of about 12 million bales, approximately that fixed by Secretary Wallace in proclaiming cotton marketing quotas for 1940-41.

The Secretary's action was approved and made effective by cotton farmers in a referendum on December 9, 1939, in which more than 91 per cent of the growers voting favored the marketing quota program for the 1940-41 season. This is the third consecutive year for which quotas have been approved.

During the last two years, with marketing quotas in effect, cotton farmers, as a group, have planted well within the national acreage allotment, which has varied slightly from year to year due to variation in the average yield per acre.

The estimated 1939 crop of 11,792,000 bales was harvested from 23,928,000 acres. The planted acreage for 1939 was estimated at 24,832,000 acres, compared with a national allotment of 27,543,015 acres.

In 1938, a crop of 11,943,000 bales was harvested from 24,248,000 acres. The planted acreage for 1938 was 25,018,000 acres, compared with a national allotment of 27,310,046 acres.

The state allotments, which will be apportioned to counties, include a four per cent reserve for necessary adjustments, and a two per cent reserve for new growers. They do not include the increases which will result from the minimum allotment provisions.

These allotments will be used as a basis for calculating acreage allotments to individual cotton farms under the 1940 Agricultural Conservation Program, as well as under the 1940-41 marketing quota program and the parity payment program.

Cotton acreage allotments by states for 1940 and for 1939 follow:

State	1940 Acreage Allotment	1939 Acreage Allotment
Alabama	2,243,530	2,258,408
Arizona	196,698	196,439
Arkansas	2,270,478	2,398,547
California	405,186	404,439
Florida	80,727	81,920
Georgia	2,216,160	2,212,425
Illinois	5,200	5,200
Kansas	954	950
Kentucky	18,813	18,774
Louisiana	1,250,739	1,250,956
Mississippi	2,689,447	2,708,499
Missouri	396,308	396,626
New Mexico	115,202	115,178
North Carolina	930,509	931,034
Oklahoma	2,176,230	2,241,787
South Carolina	1,337,085	1,338,678
Tennessee	767,041	790,753
Texas	9,916,916	10,139,371
Virginia	52,950	53,031
United States	27,070,173	27,543,015

Obituary

THOMAS ARMSTRONG

Thomas Armstrong, long associated with the Virginia-Carolina Chemical Corporation, died on December 24th after a short illness. He was 73 years of age.

For about 60 years, Mr. Armstrong was active in the Virginia-Carolina Chemical Corporation and its predecessor companies, serving in executive capacity in a number of the subsidiary mining and chemical companies. He was prominently identified with the development of the chemical industry in the South.

SUPERPHOSPHATE PRODUCTION INCREASING

Figures compiled by The National Fertilizer Association show that during the first 11 months of 1939 the production of superphosphate totaled 2,938,070 tons as compared with 2,741,305 tons during the same period of 1938, an increase of 7 per cent. A large part of this increase came during November when the industry produced 371,818 tons, the largest November production since 1930. Shipments for the same 11 months totaled 3,558,883 tons, as compared with 3,368,717 tons during January-November, 1938. Stocks on hand at the end of November amounted to 1,508,231 tons, a slight decrease from the same date in 1938.

GEORGIA STARTING SOIL TESTING SERVICE

After two years of experimental work on chemical soil tests, the Georgia Agricultural Experiment Station at Experiment, Georgia, has announced that it is prepared to make a limited number of soil tests for farmers who are interested in the Station's program. In return they are asking that the farmers conduct a small fertilizer experiment so that the Station may have a check on the results obtained from using the fertilizer program indicated by the results of the soil test. During the present winter, the tests will be made for cotton and corn only.

NEW YORK RATIOS RECOMMENDED

At an informal conference of fertilizer manufacturers and New York Agricultural officials held at Cornell University, Ithaca, on December 15th, the question of fertilizer rates and grades was discussed and the following list was adopted, to be recommended for the 1940 season:

Ratios	Approved Analyses
1-2-1	10-20-10, 5-10-5
1-2-2	8-16-16, 5-10-10, 4-8-8
1-3-1	6-18-6, 4-12-4
1-4-1	5-20-5, 4-16-4
1-4-2	5-20-10, 3-12-6
1-2-3	4-8-12
1-4-6	3-12-18, 2-8-12
0-1-1	0-20-20, 0-12-12
0-2-1	0-20-10
1-1-1	10-10-10, 7-7-7
0-2-3	0-12-18

HOLLESEN ELECTED PRESIDENT OF PIONEER POTASH

The Pioneer Potash Company announces the election of Harry H. Hollesen to the office of president and treasurer, replacing Richard Meyer, of the Gans Steamship Line, who temporarily acted in that capacity. The following vice-presidents were also named: Arthur Mehl and H. W. Schmitz at the New York office and Werner Duehrssen at the Norfolk office.

Roland A. Payne will be in charge of the New England territory, with offices at Hamden, Conn., and Kurt Duehrssen will handle the Middle Atlantic territory with headquarters at Baltimore. The company will also operate an agricultural and scientific office at San Juan, Puerto Rico, under Otto Hoch, and another at Havana, Cuba, under C. E. Beauchamp.

FIELD TESTS WITH TVA FERTILIZERS IN ALABAMA

From 1934 to 1938, inclusive, the Alabama Experiment Station conducted a total of 385 experiments comparing TVA phosphates with normal 20 per cent superphosphate. Cotton was the test crop, and the fertilizers were applied on the basis of 600 pounds of 6-10-4 per acre. When the fertilizer was acid-forming, the several phosphates rated as follows: normal superphosphate 100, di-calcium phosphate 99, triple superphosphate 92, and tricalcium phosphate 81. When used as sources of phosphorus in non-acid-forming fertilizers, normal superphosphate and concentrated superphosphate were approximately equal in efficiency. Field observations indicated a need for supplements to concentrated phosphorus carriers. Gypsum was needed when the fertilizer was made from sodium nitrate, concentrated superphosphate, and muriate of potash, but when the fertilizer was made from ammonium sulphate, concentrated superphosphate, and muriate of potash, dolomite was more important.

RAGWEED IMPROVES TOBACCO QUALITY

In a recent statement by the U S. Department of Agriculture, the practice of allowing ragweed to grow on tobacco soil during the fallow year in crop rotation practice produces a crop of better quality than when the land is left bare.

The general beneficial effect of the weed fallow, report the scientists, is getting the tobacco off to a quick start and a rapid and uniform growth of the plants from transplanting time to maturity. This in turn resulted in uniformly high market value per acre and average price per pound, which demonstrates that the tobacco meets current demands for most manufacturing purposes.

The statement adds that the weed fallow does not take the place of proper fertilizer applications but rather supplements the use of plant food by producing tobacco which possesses those characteristics observed in the early days when the crop was grown on virgin land.

SULPHATE OF AMMONIA PRODUCTION STILL INCREASING

The figures issued by the U. S. Bureau of Mines show that the production of by-product sulphate of ammonia continued to increase during November. An output of 59,745 tons was recorded during that month, which is an advance of about 500 tons over the preceding month, and of about 15,000 tons over November, 1938. For the first 11 months of 1939, production totaled 518,083 tons, an increase of 32 per cent over the same period of 1938.

Production of by-product ammonia liquor amounted to 2,431 tons (NH_3 content) in November, 1939, a slight increase of about 40 tons over October, and of more than 500 tons over November, 1938. The output to date during 1939 has been 21,655 tons, which is 18 per cent higher than the production of the January-November period of 1938.

NEW NITROGEN CARTEL PROPOSED

In the annual report of one of the Belgian nitrogen producers, it was stated that some of the producers in neutral countries are trying to make arrangements for agreements similar to the former European Nitrogen Cartel which was dissolved by the start of the war in September. It is understood that prospects for such a stabilizing arrangement were encouraging.

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FERTILIZER MATERIALS MARKET

NEW YORK

Buying Interest at Minimum. Better Activity Expected Later as Manufacturers Cover Late Requirements. Scheduled Advance in Sulphate of Ammonia.

Exclusive Correspondence to "The American Fertilizer."

NEW YORK, January 2, 1940.

The inactivity which has marked the raw fertilizer materials market during recent weeks is still evident and buying interest is at an absolute minimum. One reason for this condition is undoubtedly the normal let-down over the holiday season, and due to the fact that many manufacturers are still short on their requirements for fertilizer materials, it is not too optimistic to predict an increase in activity soon.

The only change in price to be noted is the normal scheduled increase of 25 cents per ton for sulphate of ammonia. This brings the price to $28.00 per ton, which will prevail throughout the current fertilizer year.

What interest there is seems to be confined solely to inquiries for export, and small shipments continue to be reported.

Nitrate of Soda

Scheduled price of $27.00 per ton, in bulk, f.o.b. ports, still prevails.

Sulphate of Ammonia

Now selling at the increased scheduled price of $28.00 per ton and supplies are becoming more plentiful, resulting in an easier market.

Superphosphate

No change on either ordinary or triple superphosphate.

Potash

This market rules easy at the prevailing schedule of 53½ cents per unit of K_2O, in bulk, ex vessel Atlantic and Gulf Ports. The abundance of supplies is evidenced by considerable quantities of resale material now available. Several shipments of French potash have recently reached this country and it is probable that this source of supply will be maintained.

Dried Blood

Situation unchanged with practically no interest.

Tankage

No change to be noted at this time.

Nitrogenous Material

Prices remain unchanged and no buying interest.

Fish Scrap

No activity noted in this market, with prices on menhaden and Japanese sardine meal remaining the same.

Bone Meal

Still no supplies being offered from Europe, but South American material is available in small lots.

BALTIMORE

Holiday Dullness in Market with Prices Firm. Fish Meal Scarce. Burlap Market Still at Top Levels.

Exclusive Correspondence to "The American Fertilizer."

BALTIMORE, January 2, 1940.

During the holiday season of the past two weeks there was practically no interest shown in supplies of fertilizer materials, although prices remain practically unchanged.

Ammoniates.—In view of the higher prices obtainable for tankage for feeding purposes, there is very little fertilizer tankage offering. The market is nominally $4.40 per unit of nitrogen and 10 cents per unit of B. P. L., f.o.b. Baltimore.

Nitrogenous Material.—While buying interest is at a minimum, the market nevertheless remains firm, particularly on the foreign product, on account of increased ocean freights and

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the number of pounds of raw material for a desired per cent. of plant food in a ton of mixed goods—or find what per cent. of a certain plant food in a ton of fertilizer produced by a specific quantity of raw materials.

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war risk insurance. The market is nominally $3.35 per unit of nitrogen, c.i.f. Baltimore.

Sulphate of Ammonia.—According to schedule of first hands, January price of $28.00 per ton of 2,000 lb. is now in effect, but they are not accepting any further orders for prompt shipment on this basis. There is very little material offering for re-sale, although there have been some export inquiries, and it is anticipated if war continues in Europe, later on there will be a big export demand.

Nitrate of Soda.—There is no change in the market and both Chilean and American brands are unchanged at $29.00 per ton of 2,000 lb., in 100-lb. bags, f.o.b. port warehouse, with usual differential for 200-lb bags and in bulk.

Fish Scrap.—This material is practically off the market and in control of second hands. Fish meal guaranteed 55 per cent protein is still quoted at prices ranging from $58.00 to $59.00 per ton of 2,000 lb., in bags, f.o.b. Baltimore.

Superphosphate.—The market on this commodity is firm with no heavy stocks accumulating, and present price, subject to change without notice, is $8.50 per ton of 2,000 lb., basis 16 per cent for run-of-pile, and $9.00 for flat 16 per cent grade, both in bulk, f.o.b. Baltimore.

Potash.—Most of the manufacturers in this section have already taken delivery of their spring requirements of potash, and, therefore, interest in further supplies is practically nil, although stocks are available on the basis of 53½ cents per unit, ex warehouse, Baltimore.

Bone Meal.—The market on both raw and steamed bone meal continues firm, but has now reached a point where there is practically no interest being manifested by buyers in further supplies. The nominal market on 3 and 50 per cent steamed bone meal continues at $32.00 to $36.00 per ton, according to quality, with 4½ and 50 per cent South American raw bone meal obtainable at $30.00 to $32.00 per ton of 2,000 lb., c.i.f. Baltimore.

Bags.—The burlap market during the past two weeks has been hitting peaks as well as valleys, with net result of the market for January/April still being about $160.00 per thousand for plain, new 10-oz., basis 40 cut 54 in., delivered Baltimore. Not much interest is being shown in bags by manufacturers at current market.

CHICAGO

Improvement in Demand for Fertilizer Organics Expected. Feed Material Market Slow.

Exclusive Correspondence to "The American Fertilizer."

CHICAGO, January 2, 1940.

The year closed without change in the quiet ammoniate market. It is believed by many in the trade that conditions are about ripe for an improvement in the demand. If this does occur, it may be, buyers will not find as much material on the market as they probably anticipate.

Trading in the feed market has been dragging. Producers find buying demand slow, which naturally causes a lessening in the call for materials.

Nominal prices are as follows: High grade ground fertilizer tankage, $3.25 to $3.50 ($3.95 to $4.25½ per unit N) and 10 cents; standard grades, crushed feeding tankage, $3.90 to $4.00 ($4.74 to $4.86 per unit N) and 10 cents; blood, $3.80 to $3.85 ($4.62 to $4.68 per unit N); dry rendered tankage, 80 to 85 cents per unit of protein, Chicago basis.

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WILMINGTON

Market Quiet Over Christmas. Fishing Improves at End-of-Season Spurt.

Exclusive Correspondence to "The American Fertilizer."

WILMINGTON, January 2, 1940.

Fertilizer buyers took a holiday over Christmas, literally—for no buying was noted in this market. Prices were largely nominal; offerings of small parcels of blood and other packing house products were made but no interest was drawn.

Cottonseed meal continues very firm, with some tonnage yet to be bought by the late buyers.

Fishing has improved considerably over the holidays and good catches were reported along the Carolina coast up to the past week end. Since that time, however, the weather has been very cold and the fish elusive. Normally the fishing is over at Christmas and the present flurry is probably only the last "flip of the tail" before weather forces a general closing down.

Prices were a little softer on dried scrap, but acidulated remains at $2.50 ($3.04 per unit N) and 50.

PHILADELPHIA

Buyers Unwilling to Increase Stocks of Materials. Increased Activity May Stiffen Prices.

Exclusive Correspondence to "The American Fertilizer."

PHILADELPHIA, January 2, 1940.

Buyers were unwilling this week to increase their inventories, and offerings of fertilizer materials went without interest. Prices are slightly easier but with stocks so low any small buying activity will probably stiffen prices considerably.

Nitrate of Soda.—Deliveries small on contracts. Price remains $27.00 in bulk, with usual differential in 200-lb bags and 100-lb. bags.

Sulphate of Ammonia.—Price advanced 25 cents per ton as of January 1st. Shipments on contracts fair in volume.

Dried Blood.—Being offered at $3.60 to $3.70 ($4.37½ to $4.49½ per unit N), with little interest being shown.

Tankage.—Nominal price about $3.50 ($4.25½ per unit N) and 10 cents.

Bone Meal.—1 and 65 quoted at $31.00 to

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BONE MEALS

POTASH SALTS

DRIED BLOOD

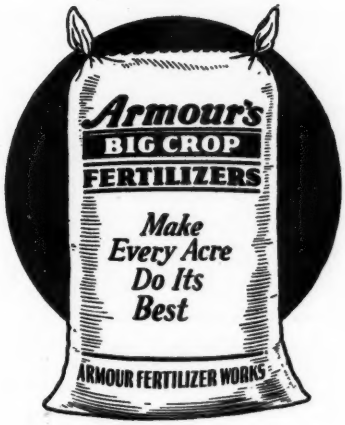
TANKAGES

COTTONSEED MEAL

BONE BLACK

PIGMENT BLACK

SODIUM FLUOSILICATE



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Wilmington, N. C.

$32.00; 3 and 50 at $31.50; and 4½ and 45 at $35.00.

Superphosphate.—Continues strong. Deliveries will begin to increase during this month.

TENNESSEE PHOSPHATE

Banner Year in All Phosphate Lines During 1939. Large Plants Resume Operations. New Metaphosphate Plant Discussed.

Exclusive Correspondence to "The American Fertilizer."

COLUMBIA, TENN., Decemer 30, 1939.

The year 1939 is closing with one of the best records in the phosphate industry in Tennessee for a number of years. Shipments into all consuming channels have held up with unusual uniformity throughout the year; all lines of production and consumption in the field have made additions to capacity at both producing and consuming ends; and old channels of consumption, which have been out of operation for several years, are being put in condition to renew operations.

The Consolidated Phosphate Co. holdings, sold under court proceedings December 8th, at $13,000.00 for the 4,000 acres, were advanced and finally bid in on December 18th at $36,000.00, the sale now awaiting final confirmation at the next term of Chancery Court. This figure with the $35,000.00, paid previously by TVA for some of the mineral rights, makes a total of about ten cents on the dollar on the original price paid by stockholders, but as it is only about 75 cents on the dollar of the bonds, which carried twenty to thirty years' accrued interest, the stockholders get nothing at all. All the lands were bid in by the Trustees for the bondholders, except a few hundred acres on Leatherwood Creek, in Maury County, bid in by Miss Grace Fry.

Monsanto has announced resumption of full operations of all three furnaces on January 2nd, after a two months' shutdown of two of them. There has been very little, if any, increase of unemployment during the shutdown, as forces were used in repairs and reconstruction, and vacation periods with pay arranged to take up the slack.

Victor Chemical Works' addition of two more electric furnaces and a nodulizing plant of sufficient capacity for all three have been completed by Stone & Webster Engineering Co., and are being put in operation with the beginning of the new year.

The matter of location of proposed blast furnace plant for making metaphosphate by TVA is still under discussion. Congressman Courtney is endeavoring to have the plant located at Franklin, and it is rumored that TVA prefers to locate the plant near their substation at Kraus Crossing in Maury County. As the building of such a plant anywhere is considered by many as merely a waste of taxpayers' money and can serve no purpose of real value to any one except those fortunate enough to have jobs building and running it and selling materials, it cannot make any real difference just where it is finally located.

The death of Joseph Hutton, president of the Middle Tennessee Bank last week, in his 80th year, is mourned by a large number of friends all over Tennessee. In addition to his long and successful career in banking, Mr. Hutton was largely interested in farming and for several years was head of the Winona Fertilizer Co., in Mississippi.

The Phosphate rock shipped for direct application in 1939 was over 33 per cent greater in amount than in 1939, and the tonnage for that consumption has been exceeded only three times in the last 40 years.

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See Page 4

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TRONA

PLANT FOOD DEVELOPMENTS

(Continued from page 8)

potash have been fairly well calibrated in the middle west and in certain areas of the northeastern states, where relatively small quantities of commercial fertilizer had been used. It is likely that some modifications in these tests will be needed for soils that have been fertilized heavily in the past, because our present methods do not fully evaluate the residual forms of these two nutrients. This, however, does not mean that we should refrain from using these tests until better ones have been developed. The methods now in use are at least helpful in roughly estimating the relative level of these two nutrients in a given soil in comparison with that of the more productive soils in that region.

Errors in making fertilizer recommendations are likely to be on the safe side in that more phosphorus and potash may be recommended than is needed immediately by the crop. If proper recommendations regarding the use of lime and organic matter are made and applied, the excessive amounts of phosphorus and potash will merely aid in building up a higher fertility level for the future. However, recommendations made by inexperienced persons may result in so great errors as to completely disrupt the nutrient balance. Soil tests should be made only by properly equipped workers and recommendations for treatment given only by those thoroughly trained in the fundamental principles of agronomy. It is encouraging to note the rapid progress being made along this line in the south. Soil testing service is now being rendered by a number of states' agencies. Recently, North Carolina has established a well equipped service capable of testing soils on a large scale throughout all parts of the state.

Grade Reduction

Another subject closely associated with soil testing is that of "grade reduction." Some are of the opinion that basing fertilizer recommendations on rapid soil tests would tend to increase the number of grades. On the contrary, the number of grades could be reduced provided a definite ratio system for N P K as 1-2-1, 1-1-2, etc., were adopted. Special grades can largely be eliminated by applying sidedressing of nitrogen or potash salts in unusual cases. In the recent revision of the recommendations for truck crop fertilization in eastern Virginia on the basis of the soil test the number of grades has actually been reduced.

Minor Elements

Our plant food development picture would by no means be complete without a brief discussion regarding the diagnosis of major and minor element deficiencies by means of visual symptoms and by rapid soil and plant tests. Advanced states of deficiency symptoms of the major and secondary elements as N, P, K, Ca, Hg have been rather accurately described for most of our important crops. Whenever possible, they should be verified by both soil and plant tests. Rapid tests of plant tissue have recently been perfected to the point where they are fairly accurate in the hands of a trained worker. Very little progress has been made in either soil or plant tests in detecting minor element deficiencies. In this case symptoms in the plant itself must serve as a basis of diagnosis, but a knowledge of the soil reaction is sometimes indicative.

Manganese, boron, zinc and copper deficiency symptoms have been described for many of our important crop plants. In some instances, particularly in case of mild boron deficiency, the symptoms may not be apparent and plants may still show growth response to applications of borax. Fifteen different important crop plants have been reported as affected by boron deficiency in the south. Boron deficiency has been recently noted in a number of the different types of trucking soils in the Norfolk, Virginia area and in some cases on fairly fertile soils where no deficiency was expected. Although we have no practical method of chemically determining boron deficiency in soils, it can readily be done by growing turnips as an indicator. Even mild cases of boron deficiency can be detected in a cross section of the turnip root, indicated by darkened diseased tissue occurring in patches in a zone which occupies the outer portion of the swollen xylem tissue. In severe cases the whole center of the root may turn dark. Studies are being made in a number of states regarding response to

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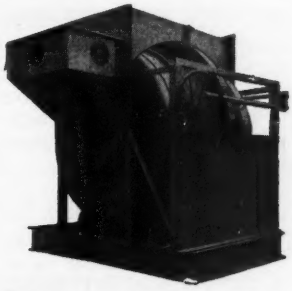

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boron and also to determine the amount that may be safely applied to different crops on various types of soil. Since response to applications of minor elements, even in areas of known deficiency, varies with crops and soils, research workers are still recommending specific treatments for definite crops in localized areas.

And finally, in closing, I wish to express the appreciation of research workers in the south for the active cooperation of The National Fertilizer Association as an organization and of the members individually in the support of plant food research and extension work.

WINTER WHEAT CROP POOREST IN YEARS

The Crop Reporting Board of the U. S. Department of Agriculture predicts a very unsatisfactory crop of winter wheat to be harvested next summer. The condition of the crop throughout the nation averaged 55 per cent on December 1, 1939, compared with 72 per cent a year ago and an average December 1st condition of 80 per cent. The previous record low condition was 69 per cent in 1932.

The drought conditions prevailing last fall throughout many parts of the wheat territory delayed fall plantings and, moreover, seriously impaired germination and rooting. Production of winter wheat is now indicated at 339,000,000 bushels, as compared with 563,000,000 harvested in 1939.

SOUTH CAROLINA FERTILIZER PAMPHLET

The South Carolina Department of Agriculture has recently issued a booklet entitled "Fertilizer and Liming Practices Recommended for South Carolina." This publication emphasizes the savings possible through the use of high-analysis fertilizers and the opportunities to use this saving on liming materials to overcome soil acidity and develop a more diversified system of agriculture. Tables are also included, which give the recommended fertilizer ratios and amounts for different crops grown under various conditions in the state.

INCREASING CROP PRICES INDICATE INCREASED USE OF FERTILIZERS

The increase in the prices of farm products which has been noticeable during the past several weeks makes the outlook for the 1940 fertilizer season better than had been expected. Corn is now 8 per cent higher than it was a year ago; cotton is 29 per cent higher and wheat 45 per cent higher. Figures compiled during the past 20 years show that higher prices received by farmers for their products have always resulted in a larger fertilizer tonnage, provided the price of fertilizer has not advanced even more rapidly. While higher bag and production costs may raise spring fertilizer prices, the increase should not be nearly as great as the average rise in crop prices.

Crop Production in 1939

With higher yields offsetting the reduction in acreage, total crop production in 1939 was only about 1 per cent lower than in 1938, and nearly 4 per cent above the average during the 1923-1932 or "predrought" period. After allowing for abandonment of nearly 19 million acres of crops planted, the area of crops harvested in 1939 is placed at 325 million acres, compared with 342 million acres in 1938. Except for the drought years of 1934 and 1936, the current acreage was the lowest since the early years of the World War.

The two outstanding crops of the year are tobacco and soybeans. Tobacco acreage was the largest since 1931 and the yield, estimated at 911 pounds per acre, topped the previous high record. The resulting production of 1,770,000,000 pounds was 7 per cent above the former record production of 1930. Soybean acreage continued its rapid increase and was more than one-third larger than in 1938.

Cotton yields were unusually high, averaging nearly 236 pounds per acre, and gave a medium sized total crop of 11,800 bales from the smallest acreage harvested in 40 years. The corn crop was equally outstanding. Four states, Ohio, Indiana, Illinois and Iowa, aver-

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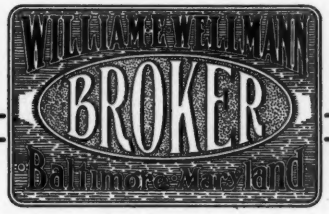

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aged 50 bushels per acre or better. These states, incidentally, are the largest users of fertilizers among those states in the Corn Belt. The total crop of 2,619,000,000 bushels came from the smallest corn acreage since 1898.

Crop	Production (in thousands) Average, 1928-37	1938	1939
Corn, all, bu.	2,309,674	2,562,197	2,619,137
Wheat, all, bu.	752,952	931,702	754,971
Winter, bu.	560,160	688,133	563,431
All spring, bu.	192,792	243,569	191,540
Durum, bu.	35,076	40,697	34,360
Other spring, bu.	157,716	202,872	157,180
Oats, bu.	1,049,300	1,068,431	937,215
Barley, bu.	233,021	253,005	276,298
Rye, bu.	36,330	55,564	39,249
Buckwheat, bu.	7,964	6,654	5,739
Flaxseed, bu.	11,943	8,152	20,330
Rice, bu.	43,387	52,506	52,306
Grain sorghums, bu.	86,296	99,136	83,102
Popcorn, lb.	.....	80,598	84,087
Cotton, lint, bales	13,800	11,943	11,792
Cottonseed, tons	6,136	5,310	5,239
Hay, all, tons	78,180	91,531	84,526
Hay, all tame, tons	68,765	81,048	75,726
Hay, wild, ton	9,414	10,483	8,800
Sweet sorghums, tons	3,595	8,452	8,666
Alfalfa seed, bu.	941	1,034	1,358
Red clover seed, bu.	997	1,905	1,714
Alsike clover seed	333	403	304
Sweetclover seed, bu.	791	1,034	1,352
Lespedeza seed, lb.	37,797	205,700	138,975
Timothy seed, bu.	1,714	1,288	1,413
Beans, dry edible, bags	12,638	15,053	13,962
Peas, dry field, bu.	4,253	3,454	3,713
Soybeans for beans, bu.	21,833	62,729	87,409
Cowpeas for peas, bu.	6,357	8,330	8,516
Peanuts picked and threshed, lb.	989,014	1,305,800	1,179,505
Velvet beans, tons	737	970	850
Potatoes, bu.	372,258	374,163	360,992
Sweet potatoes, bu.	70,690	76,647	72,679
Tobacco, lb.	1,360,400	1,376,471	1,769,639
Sorgo sirup, gal.	12,989	11,401	10,230
Sugarcane for sugar, tons	3,609	6,741	5,805
Sugarcane sirup, gal.	21,040	22,221	23,159
Sugar beets, tons	8,486	11,615	10,691
Maple sugar, lb.	1,548	1,078	760
Maple sirup, gal.	2,628	2,772	2,515
Broomcorn, tons	44	37	30
Hops, lb.	34,079	35,261	39,380
Apples, commercial, bu.	96,469	82,395	100,284
Peaches, total, bu.	54,151	51,945	61,730
Pears, total, bu.	25,489	32,473	30,910
Grapes, total, tons	2,215	2,704	2,471
Cherries (12 states), tons	125	141	185
Plums (2 states), tons	68	66	75
Prunes, used fresh (3 states), tons	49	48	55
Prunes, canned (2 states), tons	18	15	32
Prunes, dried (3 states), tons	226	238	212
Oranges (7 states), boxes	53,785	78,863	78,264
Grapefruit (4 states), boxes	18,923	43,714	36,600
Lemons (Calif.), boxes	7,881	11,322	10,650
Cranberries (5 states), barrels	599	476	671
Pecans (12 states), lb.	65,313	49,721	61,628

Commercial Truck Crops:	Production (in thousands) Average, 1928-37	1938	1939
Artichokes (Calif. only), boxes	886	873	1,122
Asparagus			
For market, crates	5,195	6,099	6,887
For processing (Calif. only), tons	54.2	44.7	47.6
Beans, lima			
For market, bu.	651	904	1,100
For processing, tons	15.1	28.7	28.6
Beans, snap			
For market, bu.	11,307	15,107	16,580
For processing, tons	75.5	128.4	90.7
Beets			
For market, bu.	1,899	1,996	2,021
For processing, tons	40.6	70.8	38.7
Cabbage, total, tons	1,082.4	1,491.4	1,135.8
For market, tons	928.6	1,296.0	989.2
For kraut, tons	153.8	195.4	146.6
Cantaloups, crates	14,962	14,973	14,402
Carrots, bu.	11,587	16,068	16,061
Cauliflower, crates	6,993	8,401	8,422
Celery, crates	9,123	11,868	11,527
Corn, sweet			
For market (N. J. only), ears	116,090	110,250	114,400
For processing, tons	647.8	882.8	647.9
Cucumbers			
For market, bu.	4,153	4,595	4,656
For pickles, bu.	5,243	6,107	3,859
Eggplant, bu.	801	961	1,092
Kale (Va. only), bu.	619	514	550
Lettuce, crates	19,433	19,676	24,066
Onions, sacks	13,797	15,038	17,470
Peas			
For market, bu.	7,359	8,505	9,627
For processing, tons	193.7	302.5	194.0
Peppers, bu.	3,960	4,970	5,066
Pimientos for processing, tons	15.1	38.8	23.2
Spinach			
For market, bu.	12,472	12,556	13,430
For processing, tons	52.2	38.6	47.2
Tomatoes			
For market, bu.	18,707	24,724	24,585
For processing, tons	1,458.6	1,742.6	1,925.5
Watermelons, melons	68,019	72,175	65,604
Garlic, sacks	151	193	193
Peppermint, lb. of oil	872	890	843
Potatoes, early, bu.	40,830	50,798	44,423
Shallots, (La. only), bu.	.....	490	674
Strawberries, crates	11,326	11,361	13,624

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For Alphabetical List of Advertisers, see page 33.

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DENS—Superphosphate
Chemical Construction Corp., New York City.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

Andrew M. Fairlie
CHEMICAL ENGINEER
22 Marietta Street Building ATLANTA, GA.
CABLE ADDRESS: "SULFACID ATLANTA"

SULPHURIC Acid Plants . . . Design, Construction, Equipment . . . Operation . . . Mills-Packard Water-Cooled Acid Chambers, Gaillard Acid-Cooled Chambers, Gaillard Acid Dispersers, Contact Process Sulphuric Acid Plants.

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DRYERS—Direct Heat
Sackett & Sons Co., The A. J., Baltimore, Md.

DRIVES—Electric
Link-Belt Company, Philadelphia, Chicago.

DUMP CARS
Link-Belt Company, Philadelphia, Chicago.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DUST COLLECTING SYSTEMS
Sturtevant Mill Co., Boston, Mass.

ELECTRIC MOTORS AND APPLIANCES
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Atlanta Utility Works, East Point, Ga.
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ELEVATORS AND CONVEYORS—Portable
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Sturtevant Mill Co., Boston, Mass.

ENGINES—Steam
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Sackett & Sons Co., The A. J., Baltimore, Md.

EXCAVATORS AND DREDGES—Drag Line and Cableway
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American Cyanamid Co., New York City.
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Farmers Fertilizer Co., Columbus, Ohio.
International Agricultural Corp., New York City.
Smith-Rowland Co., Norfolk, Va.
U. S. Phosphoric Products Corp., New York City.

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FOUNDERS AND MACHINISTS
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GARBAGE TANKAGE
Wellmann, William E., Baltimore, Md.

GEARS—Machine Moulded and Cut
Jeffrey Mfg. Co., Columbus, Ohio.
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Stedman's Foundry and Mach. Works, Aurora, Ind.

GEARS—Silent
Link-Belt Company, Philadelphia, Chicago.

GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.

HOPPERS
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IMPORTERS, EXPORTERS
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Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

INSECTICIDES
American Agricultural Chemical Co., New York City.
Burns & Company, L. D., Atlanta, Ga.

LACING—Belt
Flexible Steel Lacing Co., Chicago, Ill.

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American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
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LOADERS—Car and Wagon, for Fertilizers
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MACHINERY—Acid Making
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Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
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MACHINERY—Tankage and Fish Scrap
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Sackett & Sons Co., The A. J., Baltimore, Md.
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NITRATE OF SODA
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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Company, The, New York City.
Bradley & Baker, New York City.
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Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
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Bradley & Baker, New York City.
Huber & Company, New York City.
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Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

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PUMPS—Acid-Resisting
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Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

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Taylor, Henry L., Wilmington, N. C.
U. S. Phosphoric Products Corp., New York City.
Victor Chemical Works, Chicago, Ill.
Wellmann, William E., Baltimore, Md.

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Armour Fertilizer Works, Atlanta, Ga.
International Agricultural Corp., New York City.
U. S. Phosphoric Products Corp., New York City.
Victor Chemical Works, Chicago, Ill.

SYPHONS—For Acid
Monarch Mfg. Works, Inc., Philadelphia, Pa.

TALLOW AND GREASE
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TANKAGE
American Agricultural Chemical Co., New York City.
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Wellmann, William E., Baltimore, Md.

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UREA-AMMONIA LIQUOR
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SAMUEL D. KEIM

By-Products *and* Fertilizer Materials

(SINCE 1896)

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PHILADELPHIA, PENNA.

E. DOUGHERTY, JR., Manager

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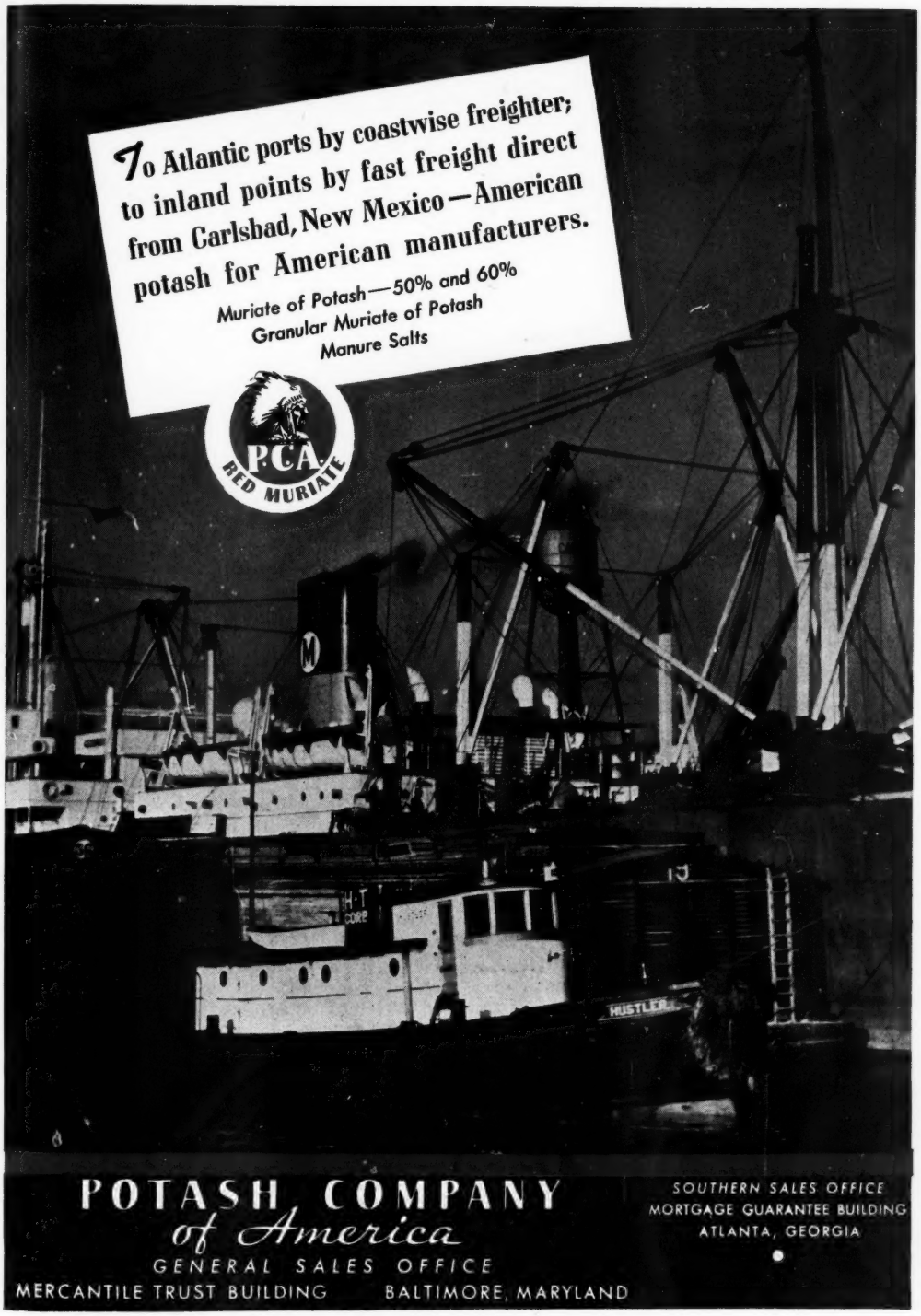
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Manure Salts
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SOUTHERN SALES OFFICE
MORTGAGE GUARANTEE BUILDING
ATLANTA, GEORGIA

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Old Sun Symbol of the Zia Indians

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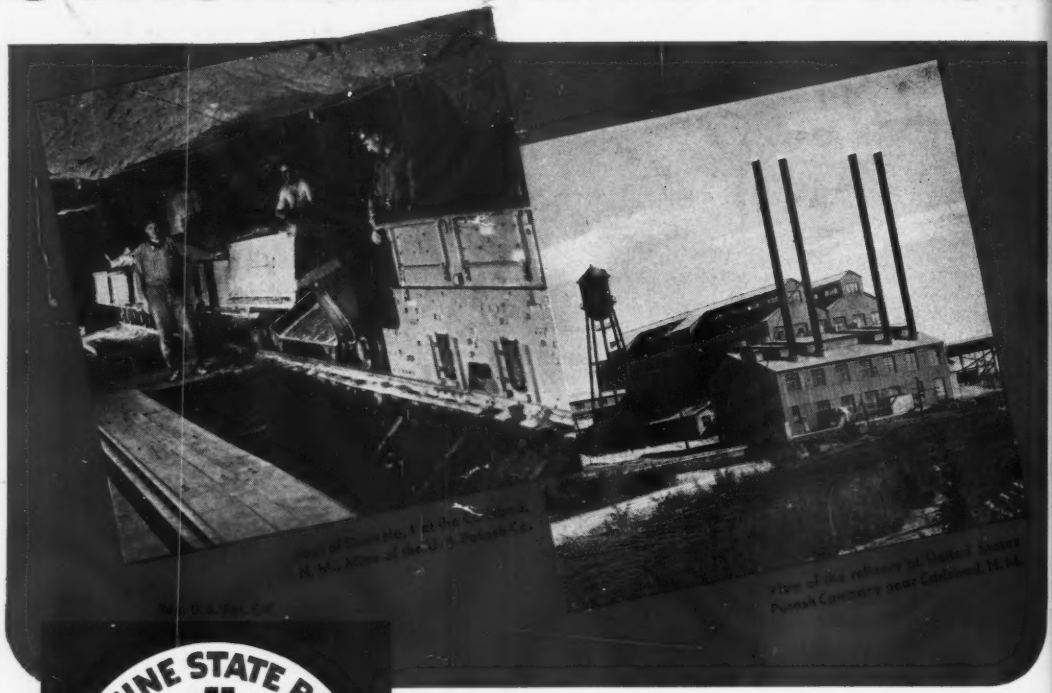

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